REMARKS

The application has been reviewed in light of the Office Action dated March 20, 2008. Claims 1-15 were pending. By this amendment, claim 1-3, 5 and 6 have been amended to clarify the claimed subject matter and new claims 16 and 17 have been added. Accordingly, claims 1-17 are now pending, with claim 1 being in independent form.

Claims 1-3, 5 and 6 were rejected under 35 U.S.C. §112, second paragraph, as purportedly indefinite.

By this amendment, claim 1-3, 5 and 6 have been amended to clarify the claimed subject matter.

Withdrawal of the rejection under 35 U.S.C. §112, second paragraph, is requested.

Claims 1-3 and 7-15 were rejected under 35 U.S.C. §102(b) as purportedly anticipated by Kusunoki '671 (WO 2003/026897 or US 2004/0207671 A1). Claims 4-6 were rejected under 35 U.S.C. §103(a) as purportedly unpatentable over Kusunoki '671. Claims 1-15 were rejected under 35 U.S.C. §103(a) as purportedly unpatentable over Ishikawa (U.S. Patent No. 6,254,213) in view of Matsuo (U.S. Patent No. 6,488,349). Claims 1-15 were rejected under 35 U.S.C. §103(a) as purportedly unpatentable over Kusunoki '912 (US 2003/0001912 A1) in view of Matsuo.

Applicant has carefully considered the Examiner's comments and the cited art, and respectfully submits that independent claim 1 of the present application is patentable over the cited art, for at least the following reasons.

The present application relates to an image formation apparatus configured to form a relatively large ink drop by sequentially discharging a plurality of ink drops from an ink drop discharging head such that the sequential ink drops merge before reaching a print target medium.

Applicant found through substantial investigation that it is desirable to discharge the sequential ink drops, except the last ink drop in the printing cycle, at an interval substantially equal to (n x Tc) + (Tc /2) (where n is an integer equal to or greater than 1, and Tc represents a resonance cycle of a pressurized ink chamber of the image formation apparatus), in order to obtain large ink drops even when the apparatus is configured for high-definition printing at a high speed.

Kusunoki '671, as understood by applicant, proposes a head driving control apparatus for driving a pressure generation part in a droplet discharge head, wherein adjacent driving pulses in a driving signal are spaced by an interval that is a multiple of the resonance period Ts. That is, a driving pulse is selected such that the parameters of the pulse including a rising time constant tr, a pulse width Pw, a falling time constant tf, and a pulse interval td have the property that tr+Pw+tf+td = n x Ts, wherein n is an integer no less than 1, and Ts is a resonance period of the pressure vibration in the pressurizing chamber.

Kusunoki '671 does not disclose or suggest, however discharging one or more of the ink drops, other than the last ink drop in a given printing cycle, at an interval substantially equal to (n x Tc) + (Tc /2), where n is an integer equal to or greater than 1, as proposed by the subject matter of claim 1 of the present application.

As discussed in paragraphs [0114] through [0138], the subject matter of the present application wherein the ink drops other than the last ink are discharged at an interval substantially equal to (n x Tc) + (Tc /2), produced superior performance (for example, larger merged droplet, greater stability, superior suppression of residual pressure vibration, etc.) as compared to when adjacent driving pulses in a driving signal are spaced by an interval that is a multiple of the resonance period Ts, such as proposed in Kusunoki '671.

Kusunoki '671 simply does not disclose, suggest or otherwise render obvious the

advantages that can be obtained by discharging the ink drops other than the last ink at an interval substantially equal to (n x Tc) + (Tc /2), where n is an integer equal to or greater than 1.

Ishikawa, as understood by applicant, proposes an ink droplet jetting apparatus, wherein a frequency of consecutive pulses in a driving signal applied to an actuator is controlled for forming respective ***consecutive dots*** at a timing of (N + 0.5) x T, where T is the time in which a pressure wave propagates within an ink chamber in one propagation direction.

However, Ishikawa, as acknowledged in the Office Action, does not involve formation of a large ink drop by multiple merging small ink drops. The apparatus proposed in Ishikawa discharges a plurality of ink drops for forming respective dots on the recording medium.

Ishikawa does not disclose or suggest, however, that such timing can obtain beneficial results when it is used to form sequential ink drops that merge before reaching a print target medium.

Applicant submits that one of ordinary skill in the art would not have found Ishikawa to be relevant to the context of the present application wherein sequential ink drops merge to form a larger ink drop prior to reaching a print target medium.

Matsuo, as understood by applicant, proposes an ink jet head comprising a driving signal supply means for supplying a driving voltage signal including a plurality of driving pulses to a piezoelectric element of an actuator, under a condition of $t1 \leq t2 \leq t3 \leq t0$, wherein t0 is the natural period of the actuator, t1 is a first time from a start of potential decrease in the potential decreasing waveform to an end of potential increase in the potential increasing waveform in the initial driving pulse, p2 is a second time from a start of a potential holding in a positive pressure potential holding waveform to an end of potential increase in a potential increasing waveform in the first subsequent driving pulse, t3 is a third time from a start of potential holding in a positive

pressure potential holding waveform to an end of potential increase in a potential increasing waveform in the second subsequent driving pulse. The corresponding driving pulses are configured such that ink droplets are discharged from the nozzle with discharge velocity gradually increasing, resulting in ink droplets merging before striking the recording medium.

Thus, in the apparatus proposed by Matsuo, each of consecutive intervals t1, t2, t3 is longer than the preceding interval, ***and each interval is less than or equal to t0, the natural period of the actuator.***

Matsuo does not disclose or suggest, however, that advantageous results can be obtained by discharging the ink drops other than the last ink at an interval substantially equal to (n x Tc) + (Tc /2), where n is an integer equal to or greater than 1, when sequential ink drops merge before reaching a print target medium.

Even with knowledge of Matsuo, one skilled in the art would not have looked to modify the apparatus proposed by Ishikawa to obtain a modified apparatus for discharging sequential ink drops wherein the sequential ink drops merge before reaching a print target medium, since such modification would have entailed a substantial overhaul of the design of the image forming apparatus.

Kusunoki '912, as understood by applicant, proposes an ink jet recording apparatus comprising a driving signal generator, wherein the driving signal generator generates an expansion pulse for increasing the capacity of the pressure chamber and a contraction pulse for reducing the capacity of the pressure chamber with a timing such that a time lag between the respective centers of the expansion pulse and the contraction pulse matches the resonance period of a meniscus generated in the nozzle by the ink in the pressure chamber.

It is contended in the Office Action that it would have been obvious to modify Kusunoki

'912 based on Matsuo.

Applicant submits that even if it would have been obvious to combine Kusunoki '912 and Matsuo (which applicant does ***NOT*** concede), the combination does not render the claims of this application obvious.

As pointed out above, Matsuo proposes that in order for the ink droplets to merge before striking the recording medium, each of the consecutive intervals t1, t2, t3 is longer than the preceding interval, ***and each interval is less than or equal to t0, the natural period of the actuator.***

Therefore, when the apparatus proposed by Kusunoki '912 is modified based on Matsuo, the modified apparatus would have an ink drop discharge interval in which the discharge interval between ink drops other than the last ink drop is set to a value ***less than or equal to the natural period of the actuator.***

Such modified apparatus would not have been discharging the ink drops other than the last ink at an interval substantially equal to (n x Tc) + (Tc /2), where n is an integer equal to or greater than 1.

Accordingly, for at least the above-stated reasons, applicant respectfully submits that independent claim 1 and the claims depending therefrom are patentable over the cited art.

In view of the remarks hereinabove, applicant submits that the application is now in condition for allowance. Accordingly, Applicant earnestly solicits the allowance of the application.

If a petition for an extension of time is required to make this response timely, this paper should be considered to be such a petition. The Patent Office is hereby authorized to charge any fees that are required in connection with this amendment and to credit any overpayment to our

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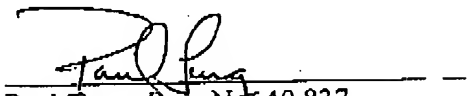
Deposit Account No. 03-3125.

If a telephone interview could advance the prosecution of this application, the Examiner is respectfully requested to call the undersigned attorney.

Respectfully submitted,



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